



STP10NB20
STP10NB20FP

N - CHANNEL ENHANCEMENT MODE
PowerMESH™ MOSFET

TYPE	V _{DSS}	R _{D(on)}	I _D
STP10NB20	200 V	< 0.40 Ω	10 A
STP10NB20FP	200 V	< 0.40 Ω	6 A

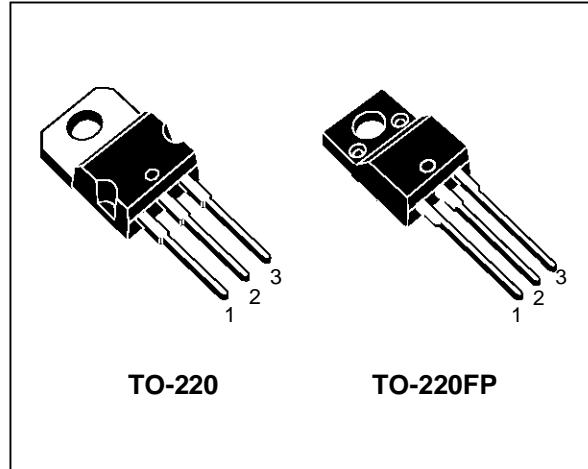
- TYPICAL R_{D(on)} = 0.3 Ω
- EXTREMELY HIGH dv/dt CAPABILITY
- 100% AVALANCHE TESTED
- VERY LOW INTRINSIC CAPACITANCES
- GATE CHARGE MINIMIZED

DESCRIPTION

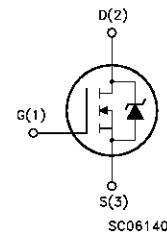
Using the latest high voltage MESH OVERLAY™ process, SGS-Thomson has designed an advanced family of power MOSFETs with outstanding performances. The new patent pending strip layout coupled with the Company's proprietary edge termination structure, gives the lowest R_{D(on)} per area, exceptional avalanche and dv/dt capabilities and unrivalled gate charge and switching characteristics.

APPLICATIONS

- HIGH CURRENT, HIGH SPEED SWITCHING
- SWITCH MODE POWER SUPPLIES (SMPS)
- DC-AC CONVERTERS FOR WELDING EQUIPMENT AND UNINTERRUPTIBLE POWER SUPPLIES AND MOTOR DRIVE



INTERNAL SCHEMATIC DIAGRAM



ABSOLUTE MAXIMUM RATINGS

Symbol	Parameter	Value		Unit
		STP10NB20	STP10NB20FP	
V _{DS}	Drain-source Voltage (V _{GS} = 0)	200		V
V _{DGR}	Drain-gate Voltage (R _{GS} = 20 kΩ)	200		V
V _{GS}	Gate-source Voltage	± 30		V
I _D	Drain Current (continuous) at T _c = 25 °C	10	6	A
I _D	Drain Current (continuous) at T _c = 100 °C	6	4	A
I _{DM(•)}	Drain Current (pulsed)	40	40	A
P _{tot}	Total Dissipation at T _c = 25 °C	85	30	W
	Derating Factor	0.68	0.24	W/°C
dv/dt(1)	Peak Diode Recovery voltage slope	5.5	5.5	V/ns
V _{ISO}	Insulation Withstand Voltage (DC)	2000		V
T _{stg}	Storage Temperature	-65 to 150		°C
T _j	Max. Operating Junction Temperature	150		°C

(•) Pulse width limited by safe operating area

(1) I_{SD} ≤ 10A, di/dt ≤ 300 A/μs, V_{DD} ≤ V_{(BR)DSS}, T_j ≤ T_{JMAX}

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THERMAL DATA

			TO-220	TO220FP	
R _{thj-case}	Thermal Resistance Junction-case	Max	1.47	4.17	°C/W
R _{thj-amb} R _{thc-sink}	Thermal Resistance Junction-ambient Thermal Resistance Case-sink	Max Typ	62.5 0.5	62.5 0.5	°C/W °C/W
T _I	Maximum Lead Temperature For Soldering Purpose		300	300	°C

AVALANCHE CHARACTERISTICS

Symbol	Parameter	Max Value	Unit
I _{AR}	Avalanche Current, Repetitive or Not-Repetitive (pulse width limited by T _j max, δ < 1%)	10	A
E _{AS}	Single Pulse Avalanche Energy (starting T _j = 25 °C, I _D = I _{AR} , V _{DD} = 50 V)	150	mJ

ELECTRICAL CHARACTERISTICS (T_{case} = 25 °C unless otherwise specified)

OFF

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
V _{(BR)DSS}	Drain-source Breakdown Voltage	I _D = 250 μA V _{GS} = 0	200			V
I _{DSS}	Zero Gate Voltage Drain Current (V _{GS} = 0)	V _{DS} = Max Rating V _{DS} = Max Rating T _c = 125 °C			1 10	μA μA
I _{GSS}	Gate-body Leakage Current (V _{DS} = 0)	V _{GS} = ± 30 V			± 100	nA

ON (*)

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
V _{GS(th)}	Gate Threshold Voltage	V _{DS} = V _{GS} I _D = 250 μA	3	4	5	V
R _{D5(on)}	Static Drain-source On Resistance	V _{GS} = 10V I _D = 5 A		0.30	0.40	Ω
I _{D(on)}	On State Drain Current	V _{DS} > I _{D(on)} x R _{D5(on)max} V _{GS} = 10 V	10			A

DYNAMIC

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
g _{fs} (*)	Forward Transconductance	V _{DS} > I _{D(on)} x R _{D5(on)max} I _D = 5 A	3	4		S
C _{iss} C _{oss} C _{rss}	Input Capacitance Output Capacitance Reverse Transfer Capacitance	V _{DS} = 25 V f = 1 MHz V _{GS} = 0		470 135 22	650 190 30	pF pF pF

ELECTRICAL CHARACTERISTICS (continued)

SWITCHING ON

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$t_{d(on)}$ t_r	Turn-on Time Rise Time	$V_{DD} = 100 \text{ V}$ $I_D = 5 \text{ A}$ $R_G = 4.7 \Omega$ $V_{GS} = 10 \text{ V}$ (see test circuit, figure 3)		10 15	14 20	ns ns
Q_g Q_{gs} Q_{gd}	Total Gate Charge Gate-Source Charge Gate-Drain Charge	$V_{DD} = 160 \text{ V}$ $I_D = 10 \text{ A}$ $V_{GS} = 10 \text{ V}$		17 7.5 5.5	24	nC nC nC

SWITCHING OFF

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$t_{r(V_{off})}$ t_f t_c	Off-voltage Rise Time Fall Time Cross-over Time	$V_{DD} = 160 \text{ V}$ $I_D = 10 \text{ A}$ $R_G = 4.7 \Omega$ $V_{GS} = 10 \text{ V}$ (see test circuit, figure 5)		8 10 20	11 14 28	ns ns ns

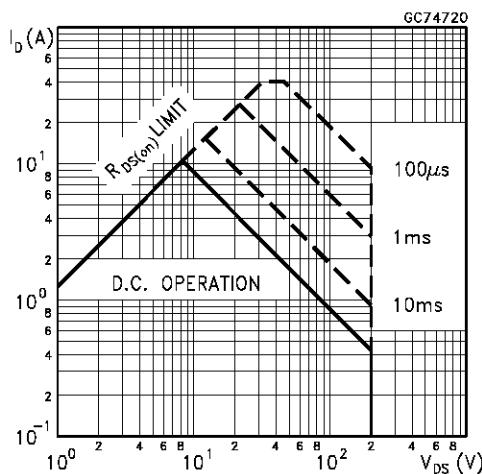
SOURCE DRAIN DIODE

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
I_{SD} $I_{SDM}(\bullet)$	Source-drain Current Source-drain Current (pulsed)				10 40	A A
$V_{SD} (\bullet)$	Forward On Voltage	$I_{SD} = 10 \text{ A}$ $V_{GS} = 0$			1.5	V
t_{rr} Q_{rr} I_{RRM}	Reverse Recovery Time Reverse Recovery Charge Reverse Recovery Current	$I_{SD} = 10 \text{ A}$ $di/dt = 100 \text{ A}/\mu\text{s}$ $V_{DD} = 50 \text{ V}$ $T_j = 150^\circ\text{C}$ (see test circuit, figure 5)		170 980 11.5		ns nC A

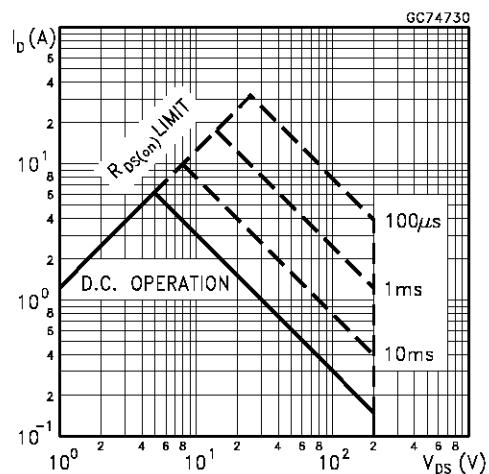
(*) Pulsed: Pulse duration = 300 μs , duty cycle 1.5 %

(\bullet) Pulse width limited by safe operating area

Safe Operating Area for TO-220

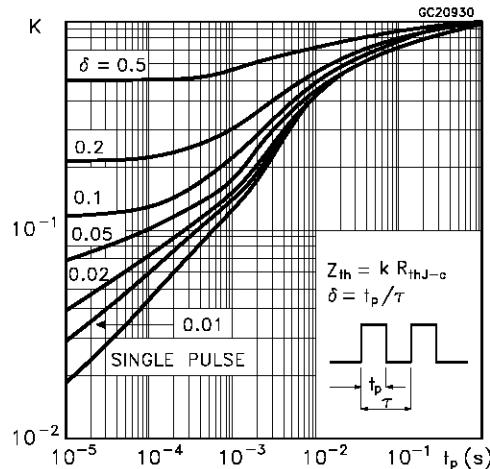


Safe Operating Area for TO-220FP

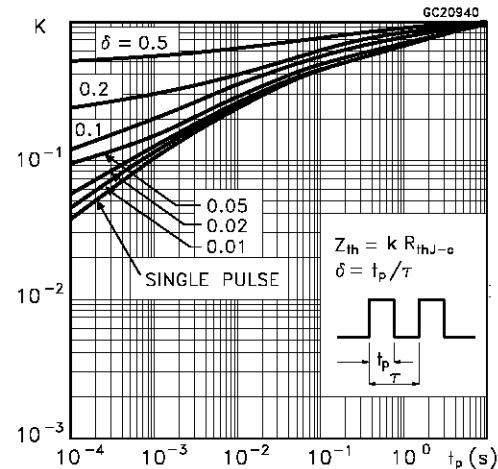


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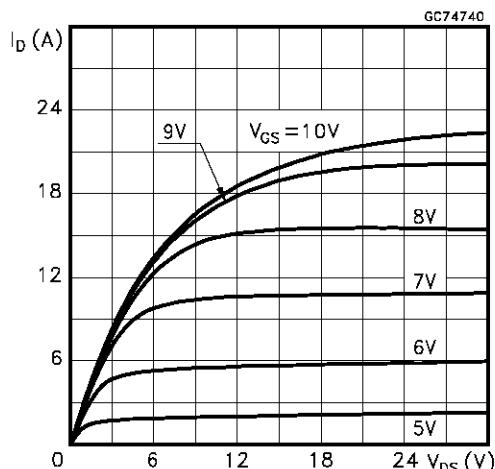
Thermal Impedance for TO-220



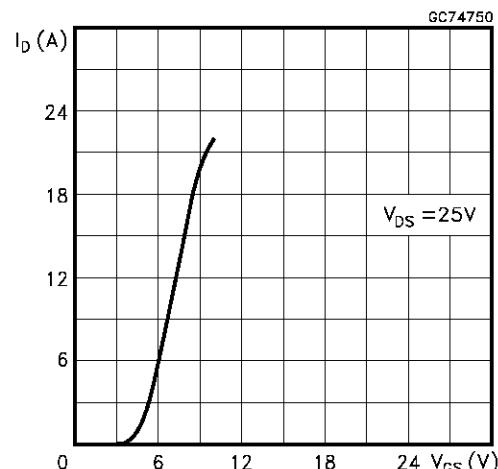
Thermal Impedance for TO-220FP



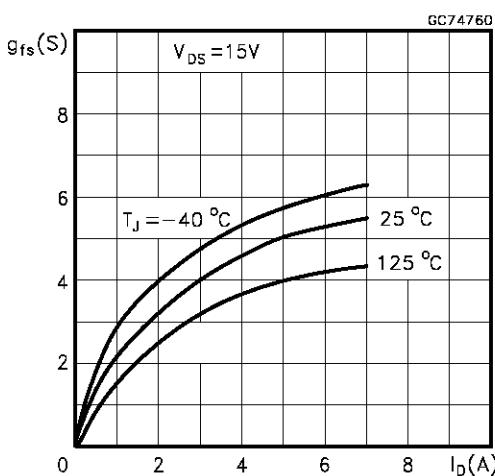
Output Characteristics



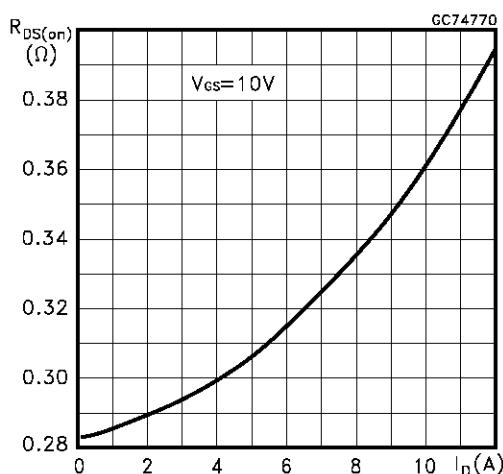
Transfer Characteristics



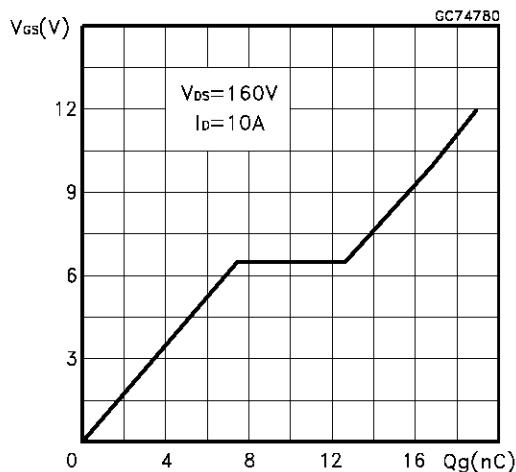
Transconductance



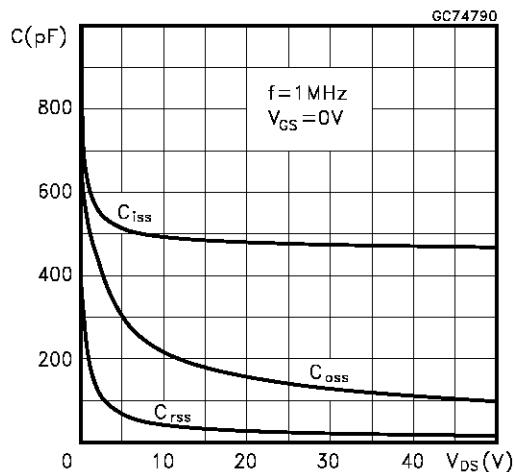
Static Drain-source On Resistance



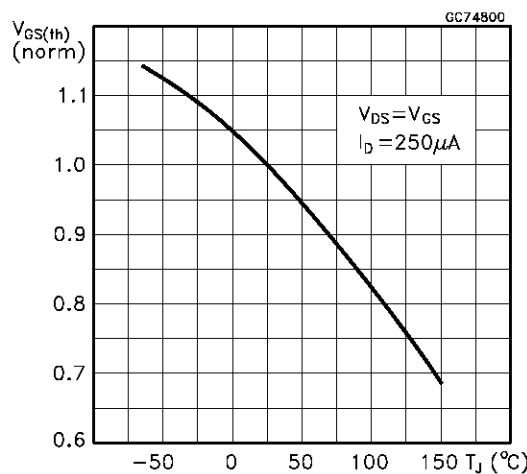
Gate Charge vs Gate-source Voltage



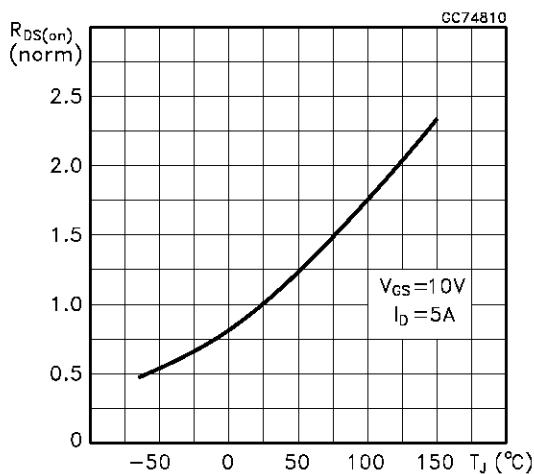
Capacitance Variations



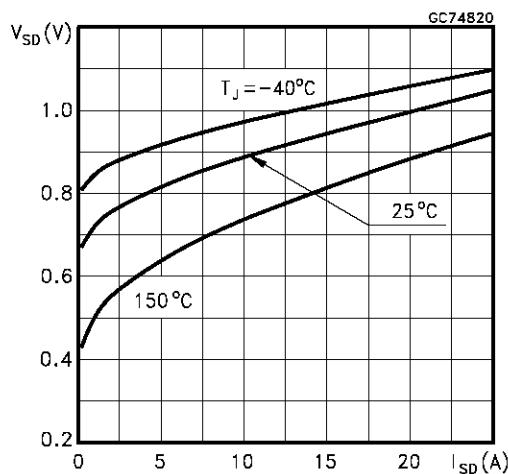
Normalized Gate Threshold Voltage vs Temperature



Normalized On Resistance vs Temperature



Source-drain Diode Forward Characteristics



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Fig. 1: Unclamped Inductive Load Test Circuit

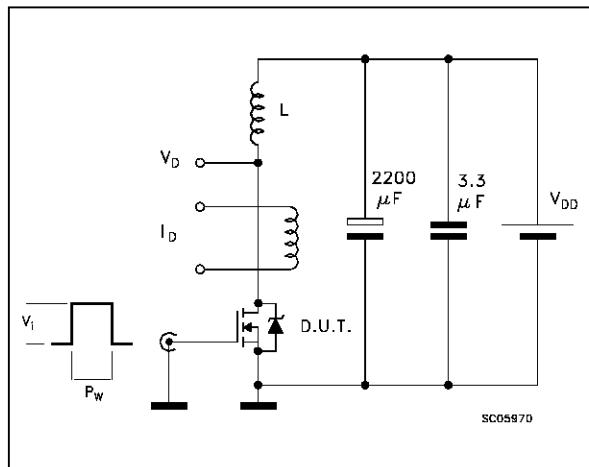


Fig. 2: Unclamped Inductive Waveform

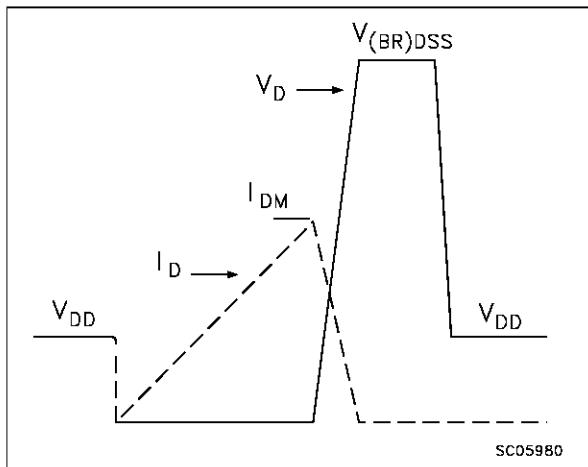


Fig. 3: Switching Times Test Circuits For Resistive Load

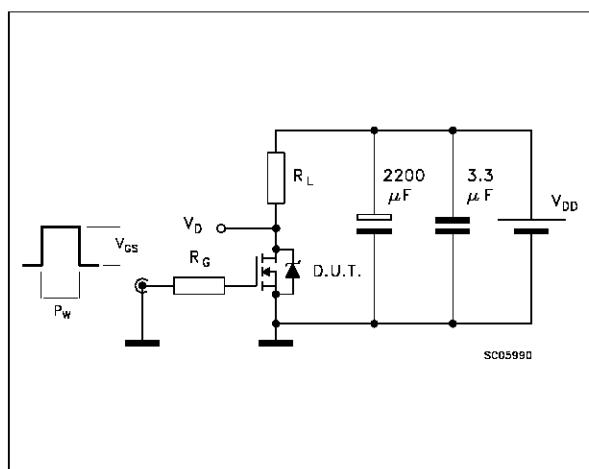


Fig. 4: Gate Charge test Circuit

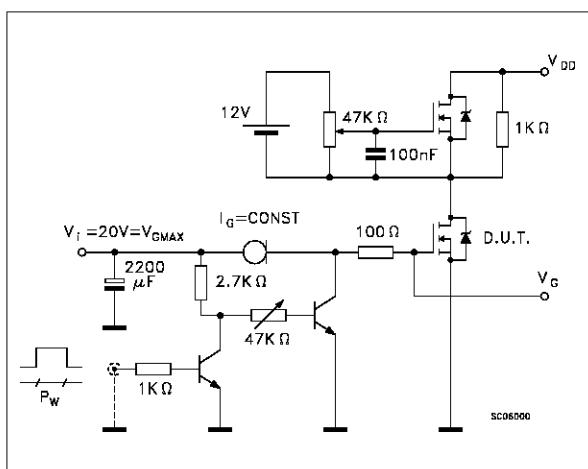
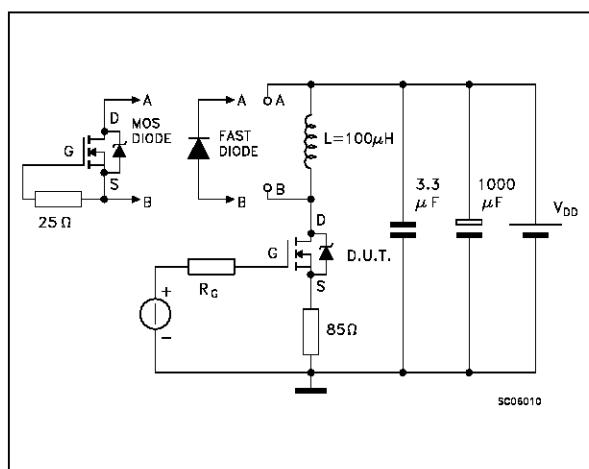
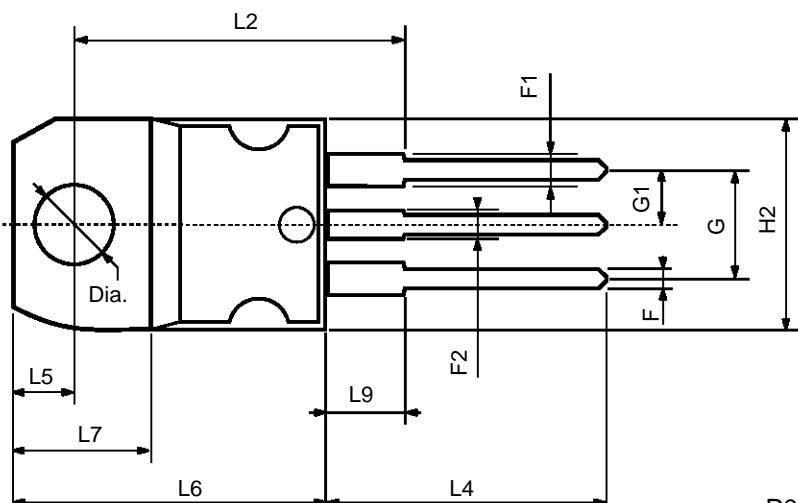
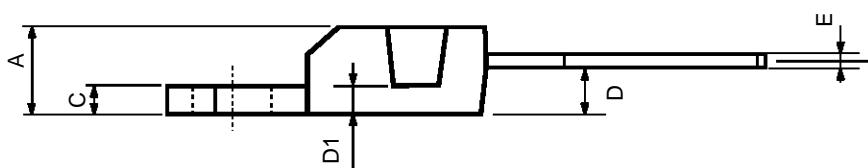


Fig. 5: Test Circuit For Inductive Load Switching And Diode Recovery Times



TO-220 MECHANICAL DATA

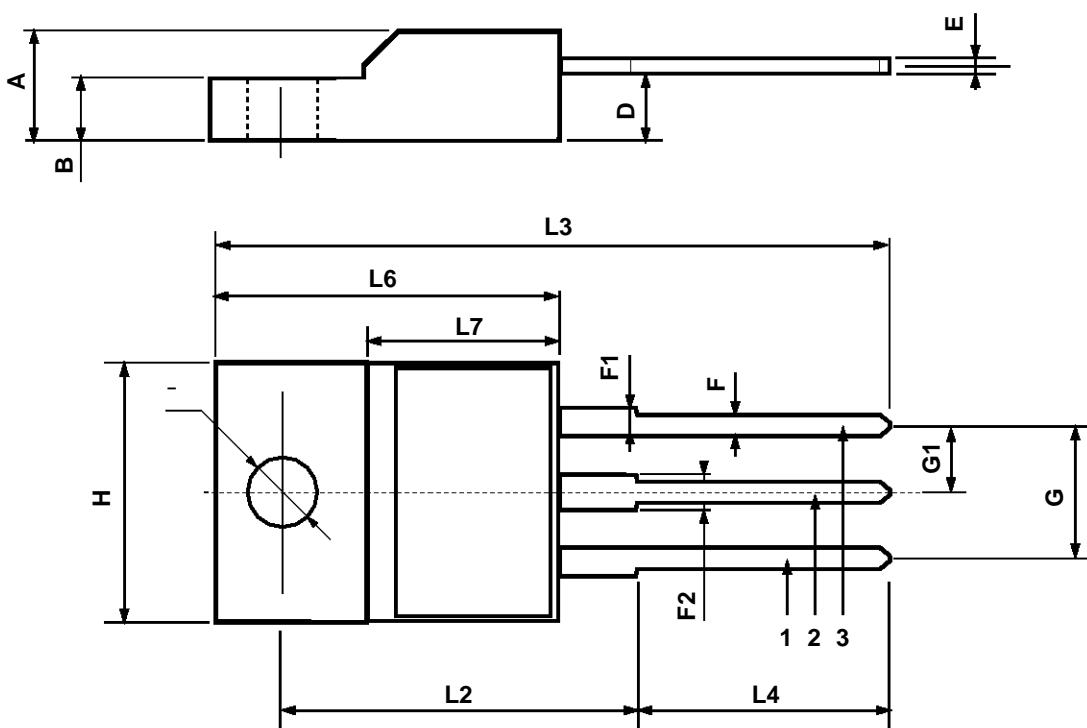
DIM.	mm			inch		
	MIN.	TYP.	MAX.	MIN.	TYP.	MAX.
A	4.40		4.60	0.173		0.181
C	1.23		1.32	0.048		0.051
D	2.40		2.72	0.094		0.107
D1		1.27			0.050	
E	0.49		0.70	0.019		0.027
F	0.61		0.88	0.024		0.034
F1	1.14		1.70	0.044		0.067
F2	1.14		1.70	0.044		0.067
G	4.95		5.15	0.194		0.203
G1	2.4		2.7	0.094		0.106
H2	10.0		10.40	0.393		0.409
L2		16.4			0.645	
L4	13.0		14.0	0.511		0.551
L5	2.65		2.95	0.104		0.116
L6	15.25		15.75	0.600		0.620
L7	6.2		6.6	0.244		0.260
L9	3.5		3.93	0.137		0.154
DIA.	3.75		3.85	0.147		0.151



P011C

TO-220FP MECHANICAL DATA

DIM.	mm			inch		
	MIN.	TYP.	MAX.	MIN.	TYP.	MAX.
A	4.4		4.6	0.173		0.181
B	2.5		2.7	0.098		0.106
D	2.5		2.75	0.098		0.108
E	0.45		0.7	0.017		0.027
F	0.75		1	0.030		0.039
F1	1.15		1.7	0.045		0.067
F2	1.15		1.7	0.045		0.067
G	4.95		5.2	0.195		0.204
G1	2.4		2.7	0.094		0.106
H	10		10.4	0.393		0.409
L2		16			0.630	
L3	28.6		30.6	1.126		1.204
L4	9.8		10.6	0.385		0.417
L6	15.9		16.4	0.626		0.645
L7	9		9.3	0.354		0.366
Ø	3		3.2	0.118		0.126



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